Epidemiology of Coronary Heart Disease

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Associated professor of nutrition

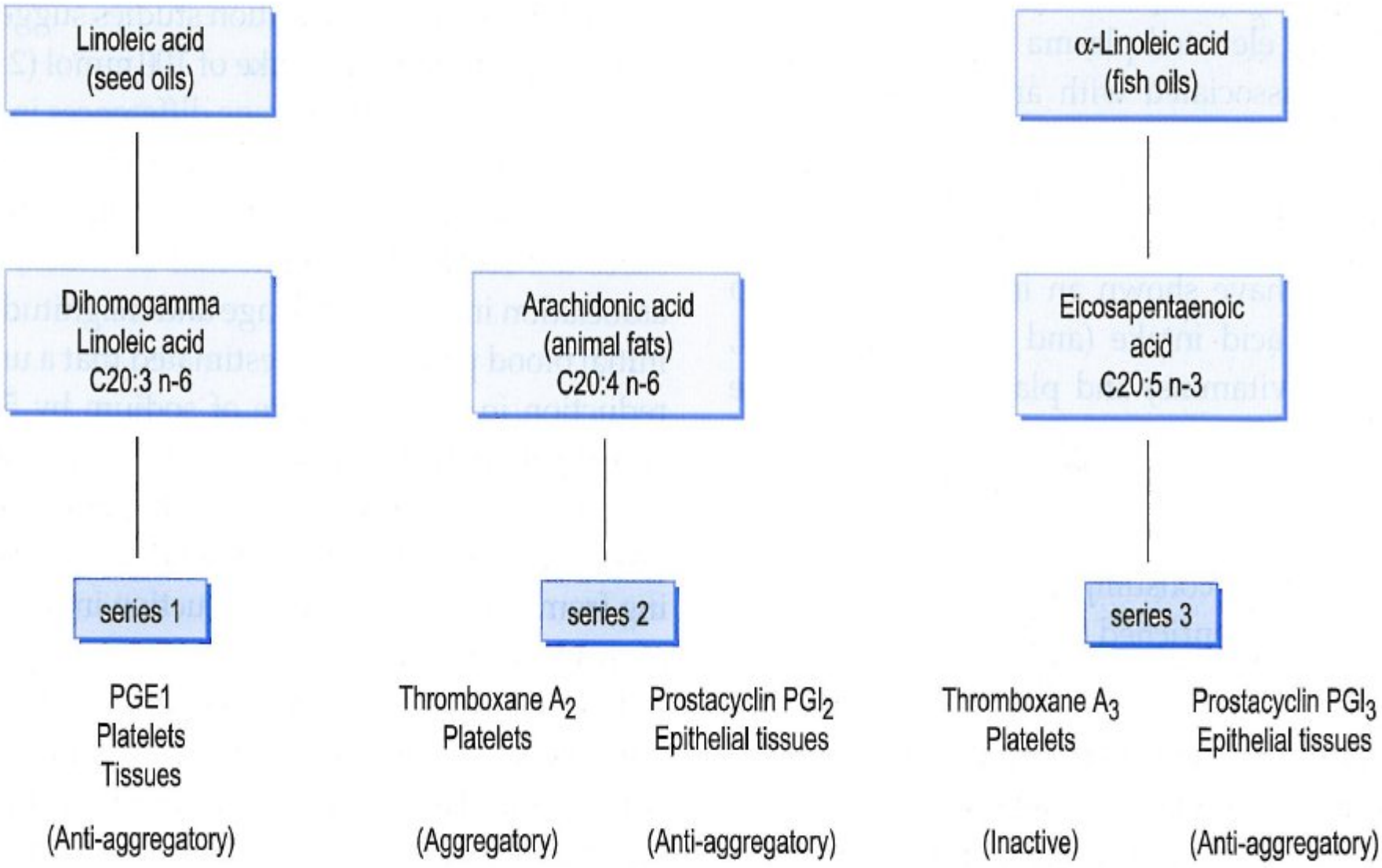


Figure 19.2 Prostanoids formed from different fatty acids (Adapted from Ulbricht & Southgate 1991).

BOX 34-2

Cardiovascular Disease Risk Factors

Major Risk Factors

Hypertension
Age (older than 45 years for men, 55 years for women)
Diabetes mellitus
Estimated glomerular filtration rate <60 mL/min
Microalbuminuria
Family history of premature cardiovascular disease (men <55 years of age, or women <65 years of age)

Modifiable Cardiovascular Risk Factors

Lipoprotein profile
- Low-density lipoprotein cholesterol, elevated
- Total triglycerides, elevated
- High-density lipoprotein (HDL) cholesterol, low

Inflammatory markers
Fibrinogen
C-reactive protein

Lifestyle Risk Factors

Tobacco use, particularly cigarettes
Physical inactivity
Poor diet
Stress
Insufficient sleep
Excessive alcohol consumption

Related Conditions

Hypertension
Obesity (body mass index >30 kg/m2)
Metabolic syndrome (including reduced HDL, elevated triglycerides, abdominal obesity)

Modified from National Institutes of Health, National Heart, Lung, an Blood Institute National High Blood Pressure Education Program: Th Seventh Report of the Joint National Committee on Prevention, Detectior Evaluation, and Treatment of High Blood Pressure, NIH Publicatio No. 04-5230, August 2004.

- An estimated 17.3 million people died from CVDs in 2008
- Over 80% of CVD deaths take place in low- and middle-income countries.
- By 2030, almost 23.6 million people will die from CVDs.

Figure 10 Distribution of global NCD by cause of death, both sexes (*1, 6*).

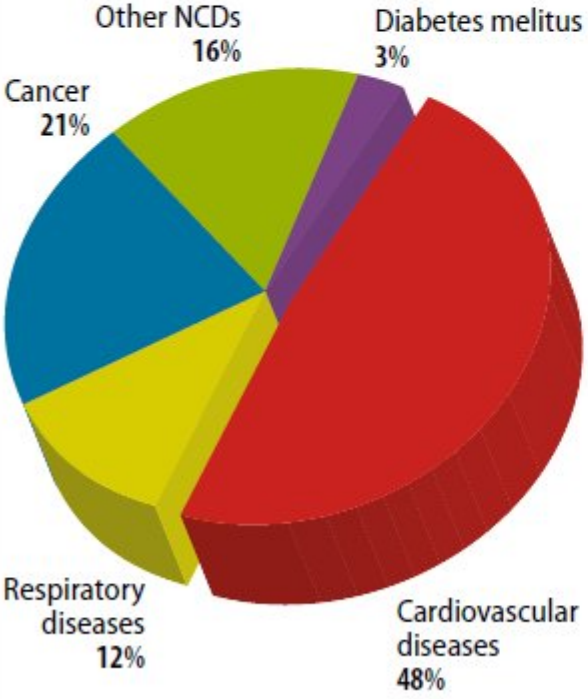
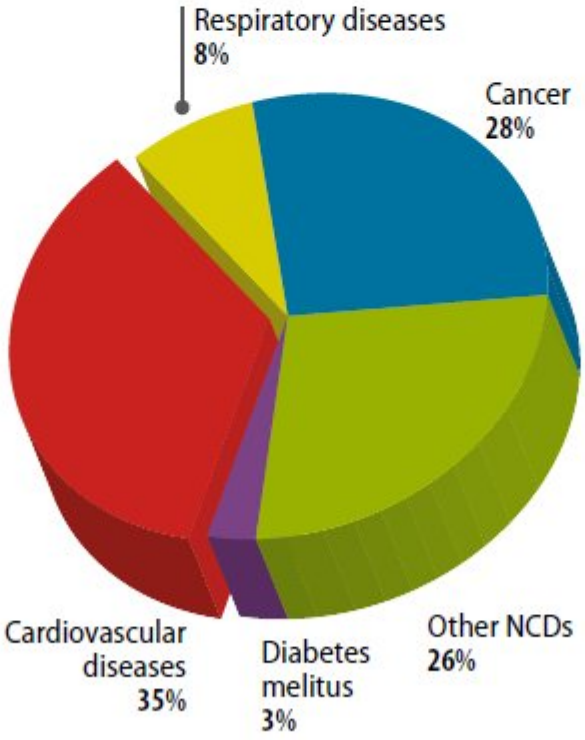


Figure 11 Distribution of global NCD by cause of death for less than 60 year old persons, both sexes (*1, 6*).



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10 facts on noncommunicable diseases
September 2011

- Noncommunicable - or chronic - diseases are diseases of long duration and generally slow progression.
- The four main types of noncommunicable diseases are cardiovascular diseases (like heart attacks and stroke), cancer, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) and diabetes.

World Health Organization

- NCDs account for 63% of all deaths.
- Noncommunicable diseases (NCDs), primarily cardiovascular diseases, cancers, chronic respiratory diseases and diabetes, are responsible for 63% of all deaths worldwide (36 million out 57 million global deaths .

World Health Organization

2

- 80% of NCDs deaths occur in low- and middle-income countries.

- 3- More than nine million of all deaths attributed to noncommunicable diseases (NCDs) occur before the age of 60.

4- Around the world, NCDs affect women and men almost equally .

World Health Organization

5-NCDs are largely preventable by means of effective interventions : tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol.

World Health Organization

•6- NCDs are not only a health problem but a development challenge as well .
They force many people into, or entrench them in poverty due to catastrophic expenditures for treatment.

World Health Organization

One and a half billion adults, 20 and older, were overweight in 2008.

World Health Organization

Nearly 43 million children under five years old were overweight in 2010.

World Health Organization

Tobacco use kills nearly six million people a year .
By 2020, this number will increase to 7.5 million, accounting for 10% of all deaths.

World Health Organization

Eliminating major risks could prevent most NCDs .
If the major risk factors for chronic disease were eliminated, at:
around three-quarters of heart disease, stroke and type 2 diabetes would be prevented; and 40% of cancer would be prevented.

Figure 29 Ranking of 10 selected risk factors of cause of death (2).

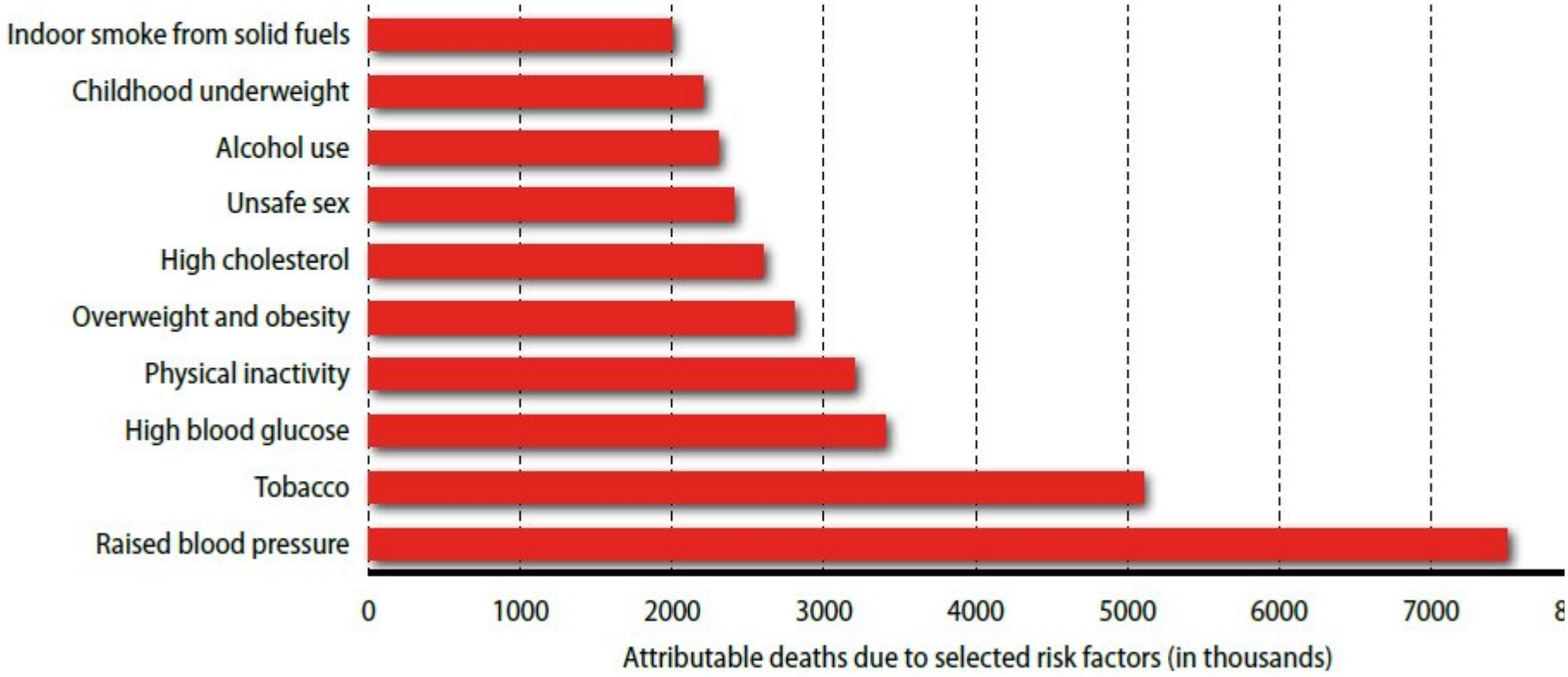


Figure 6 World map showing the global distribution of CVD mortality rates in males (age standardized , per 100 000) (*1*).

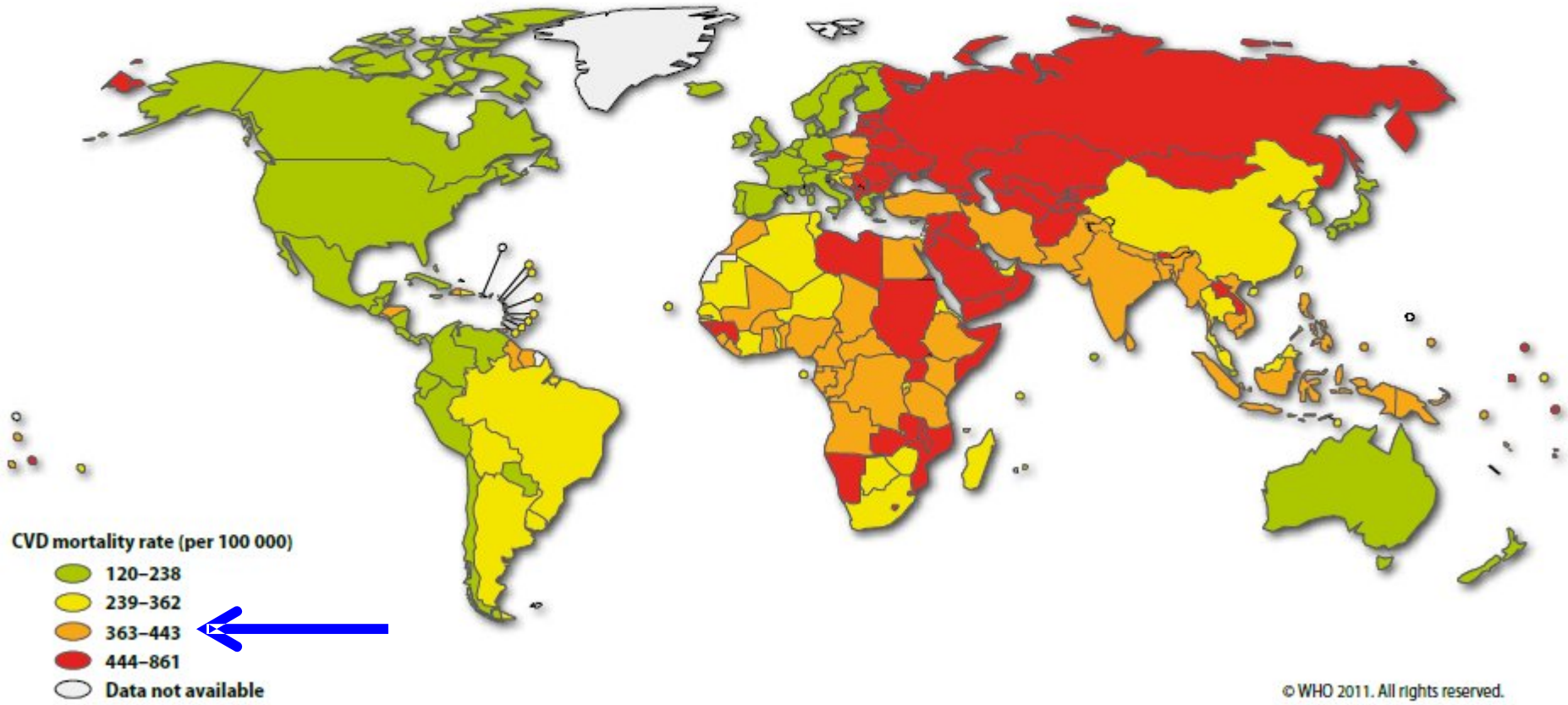


Figure 7 World map showing the global distribution of CVD mortality rates in females (age standardized, per 100 000) (*1*).

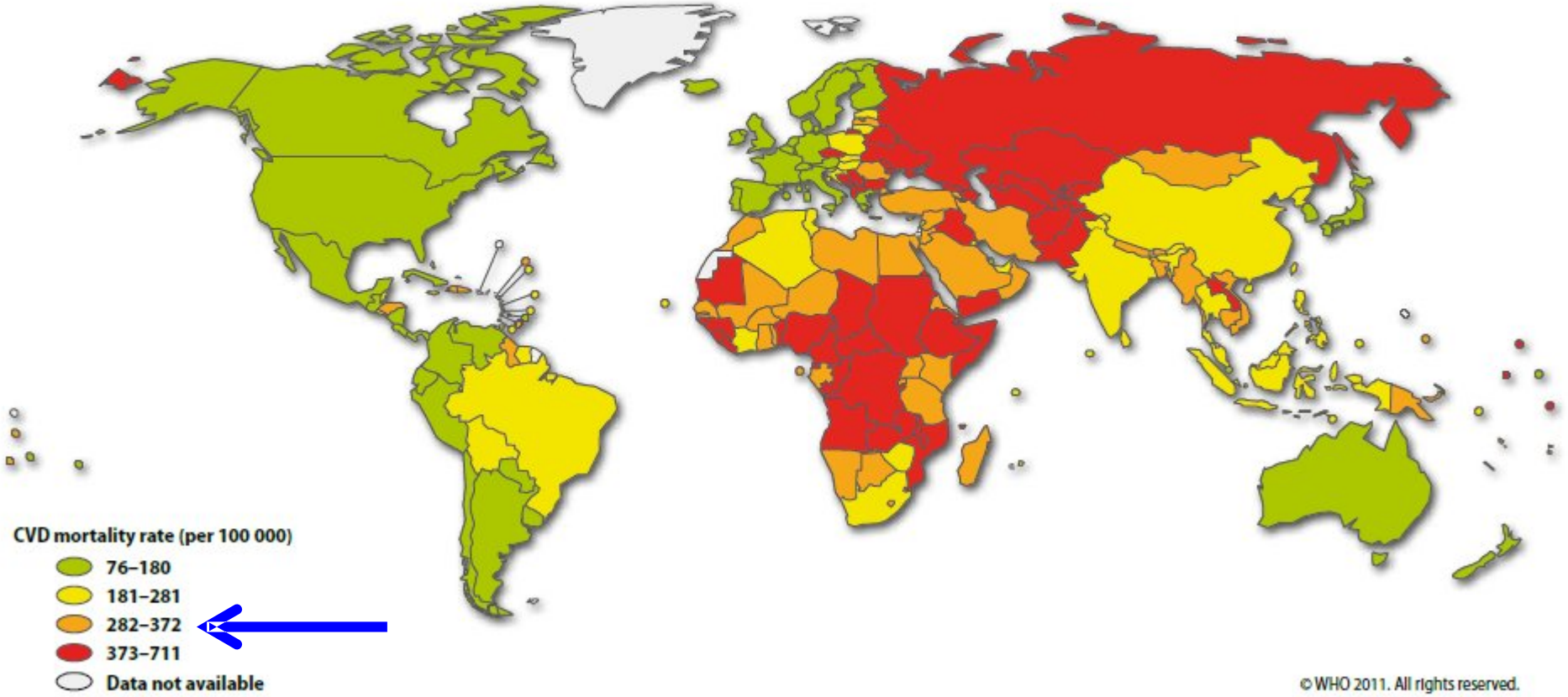


Figure 15 World map showing the global distribution of ischemic heart disease mortality rates in males (age standardized, per 100 000) (*1*).

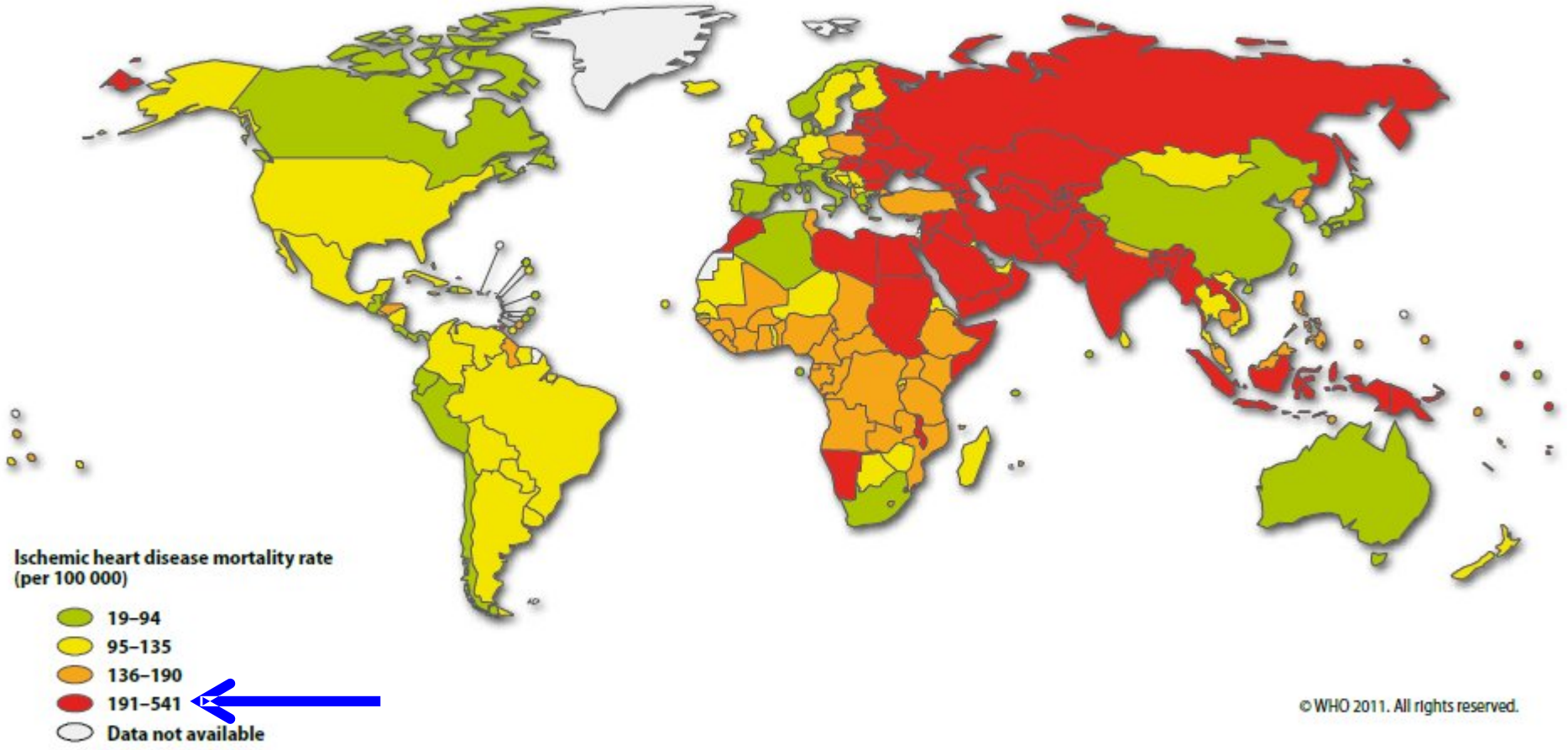
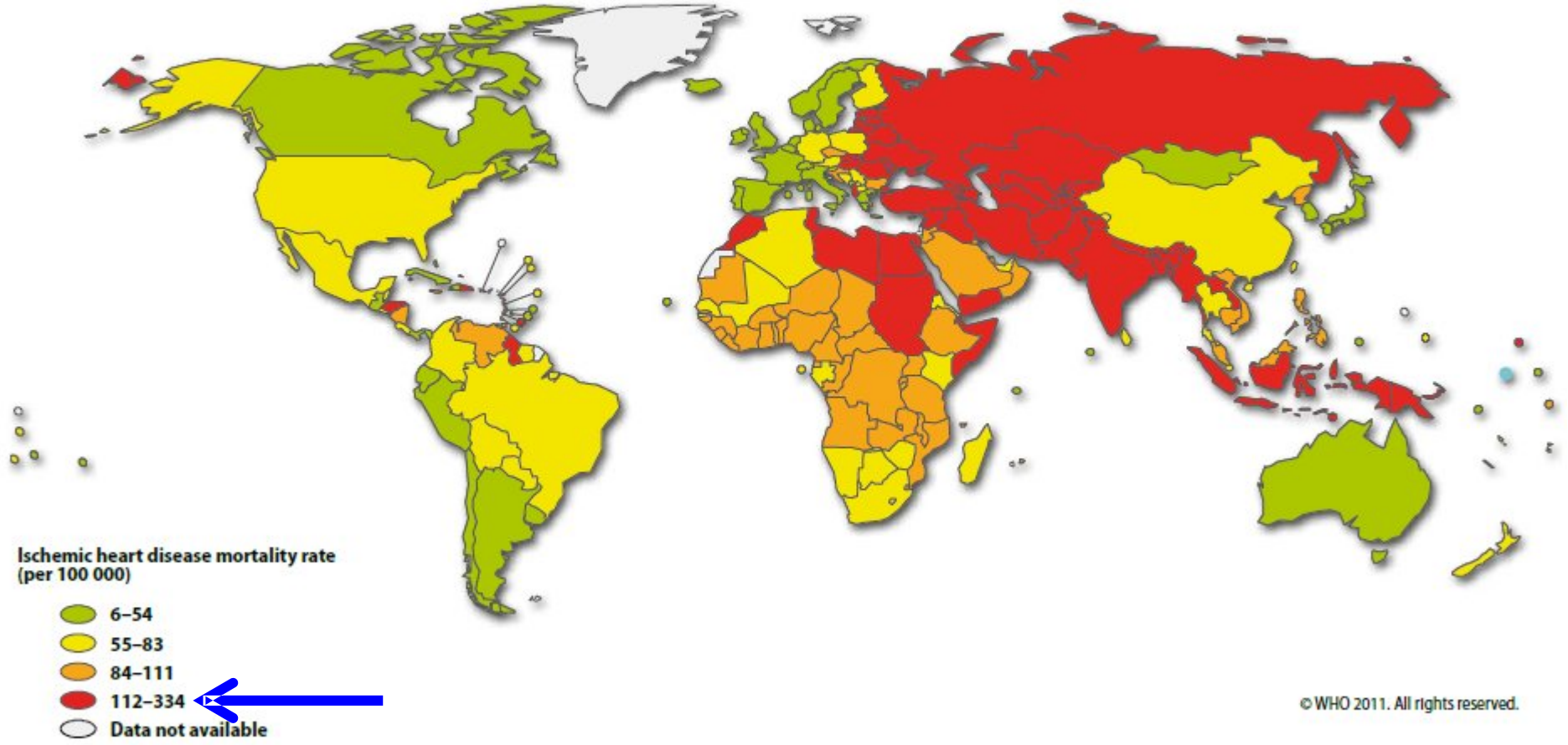


Figure 16 World map showing the global distribution of ischemic heart disease mortality rates in females (age standardized, per 100 000) (*1*).



Consumption of calorie-rich food promote obesity

Figure 41 World map showing the prevalence of overweight * in males (ages 20+, age standardized) (*6*), (*BMI ≥ 25 kg/m²).

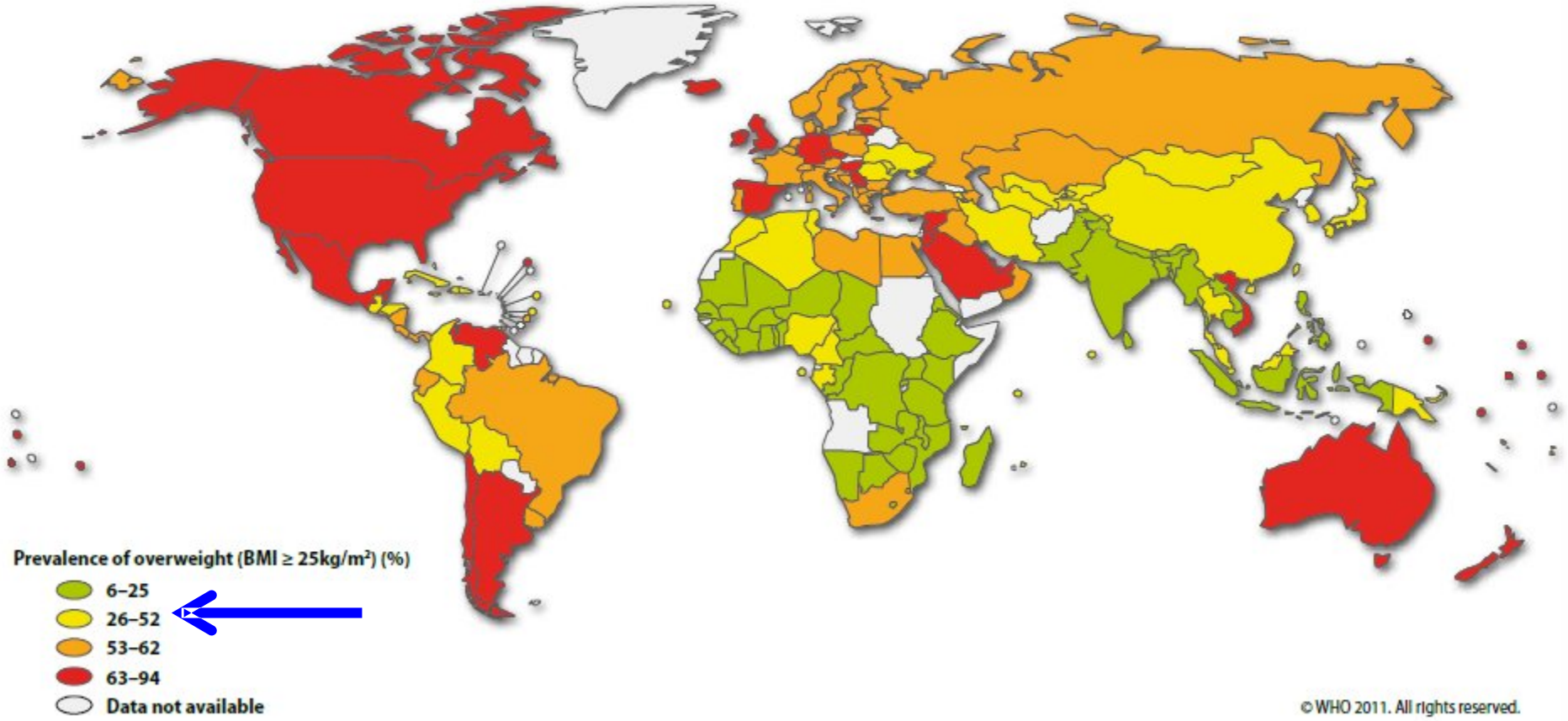


Figure 42 World map showing the prevalence of overweight * in females (ages 20+, age standardized) (*6*), (*BMI ≥ 25 kg/m²).

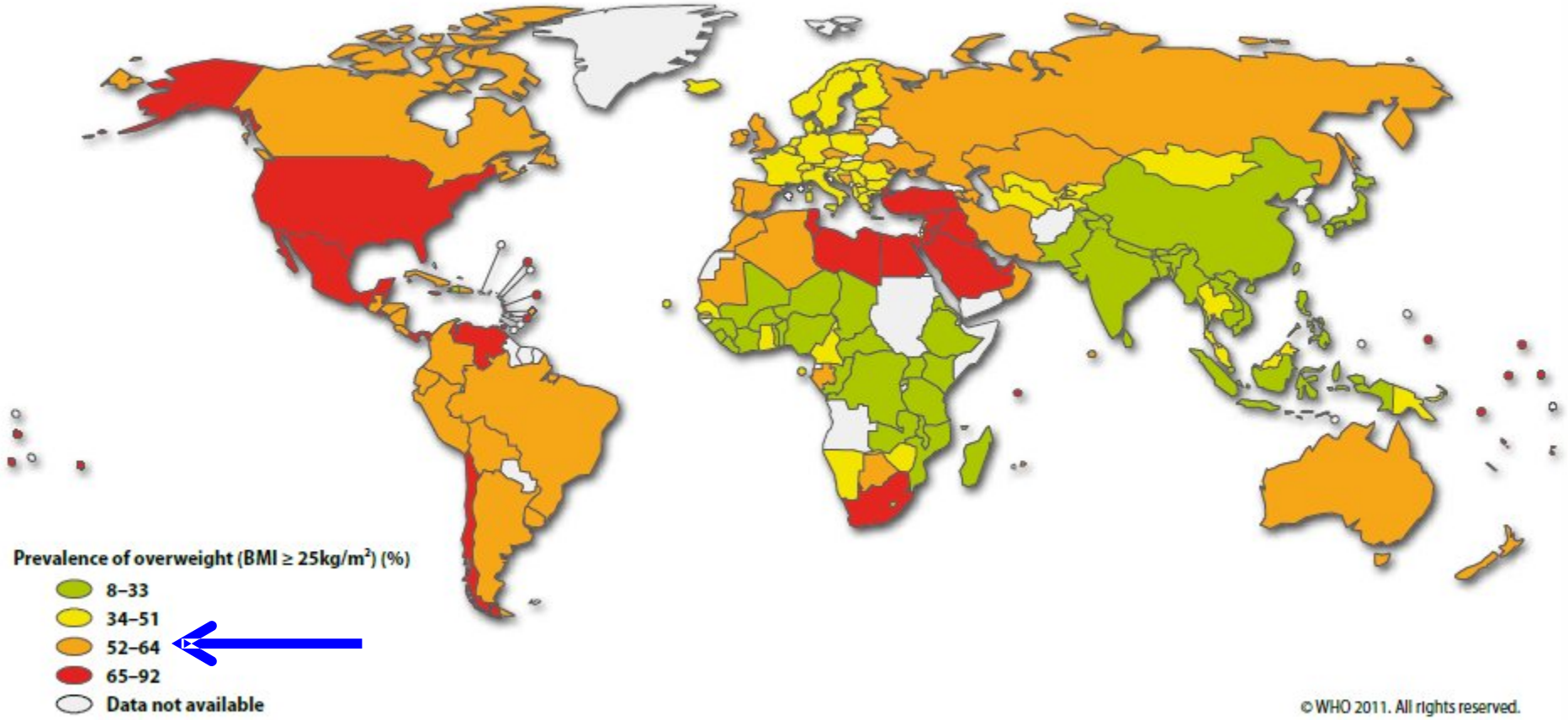
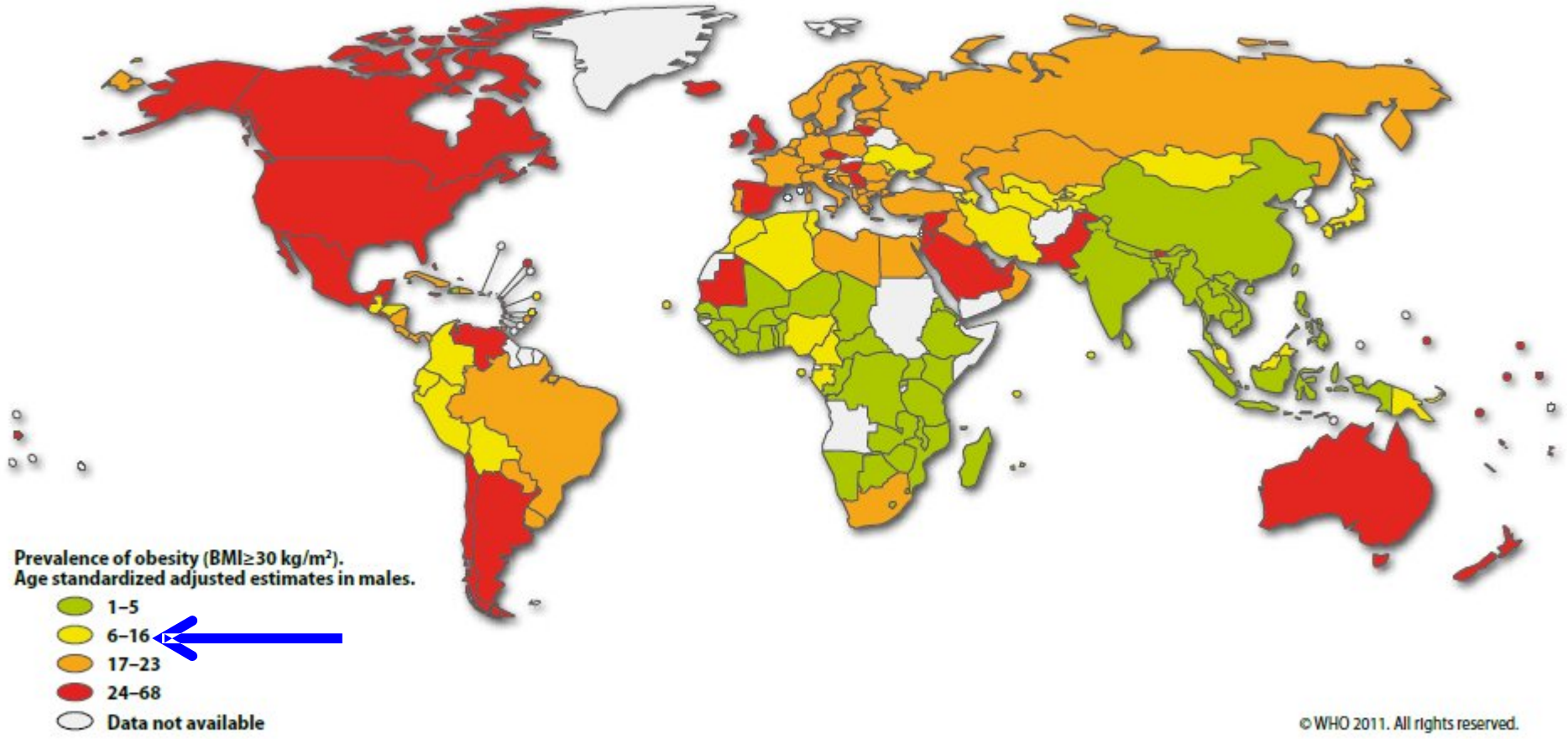


Figure 38 World map showing the prevalence of obesity * in males (ages 20+, age standardized) (6).
(*BMI≥30 kg/m²)



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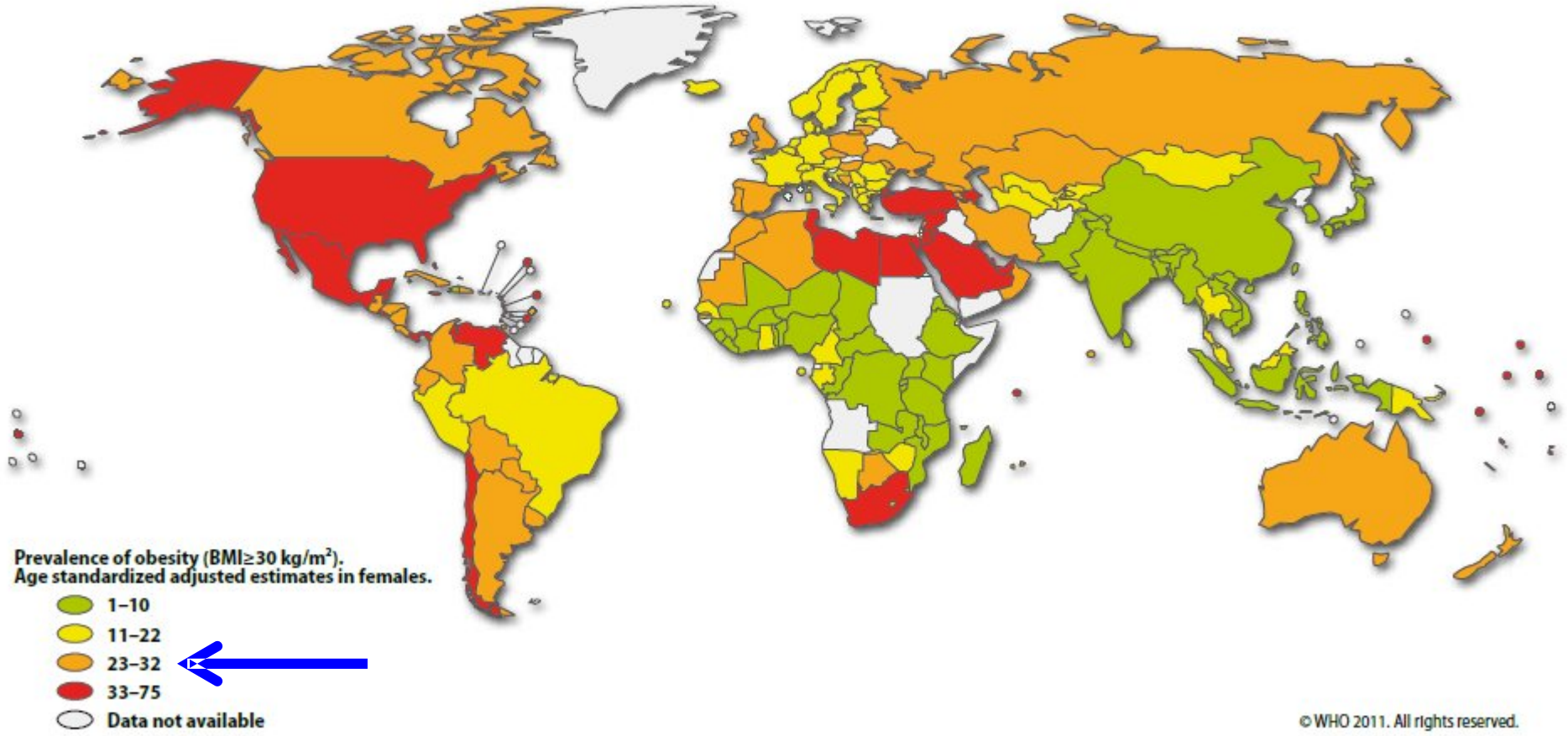
35 (41 of 164) 125% Find

Figure 39 World map showing the prevalence of obesity * in females (ages 20+, age standardized) (*6*).
(*BMI≥30 kg/m²)



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CHD in the world (WHO).pdf - Adobe Acrobat Pro

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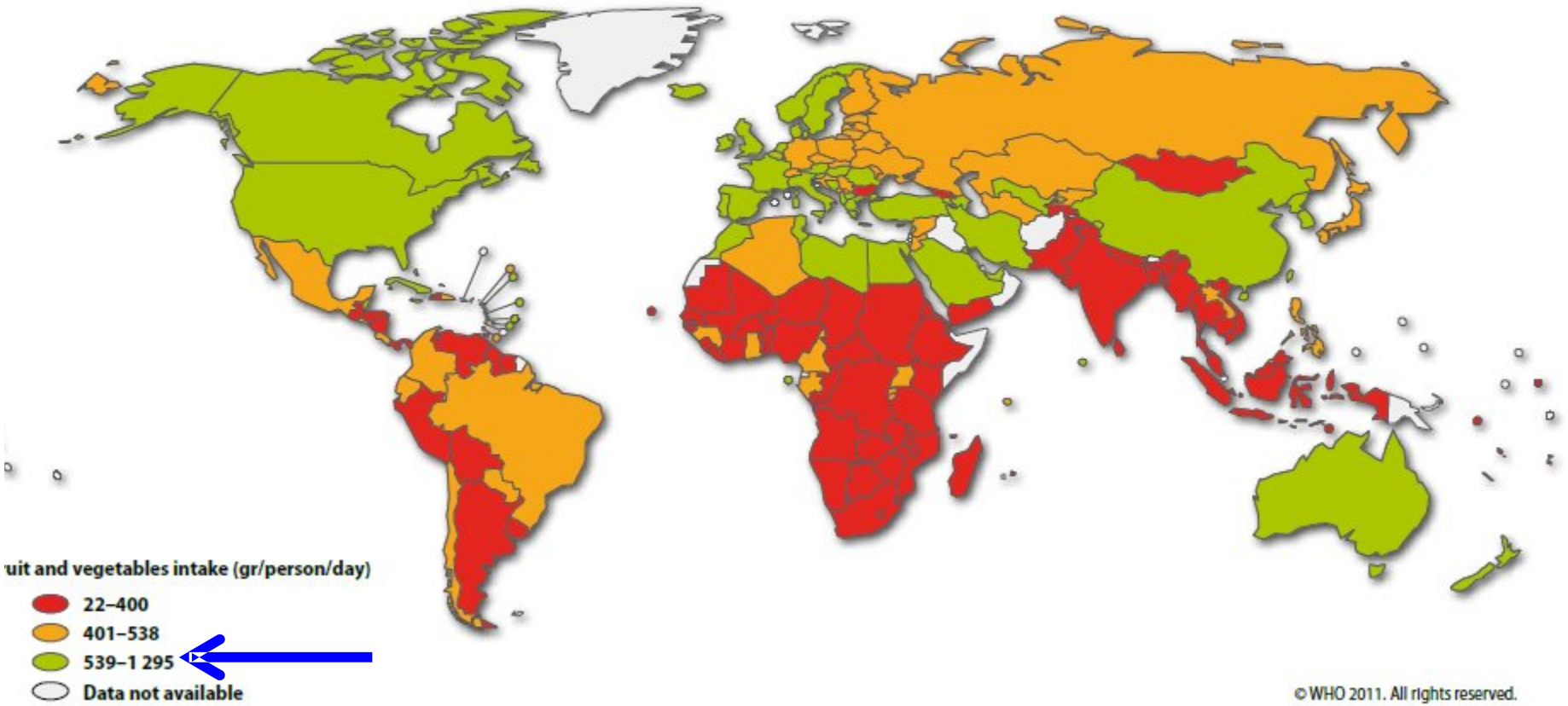
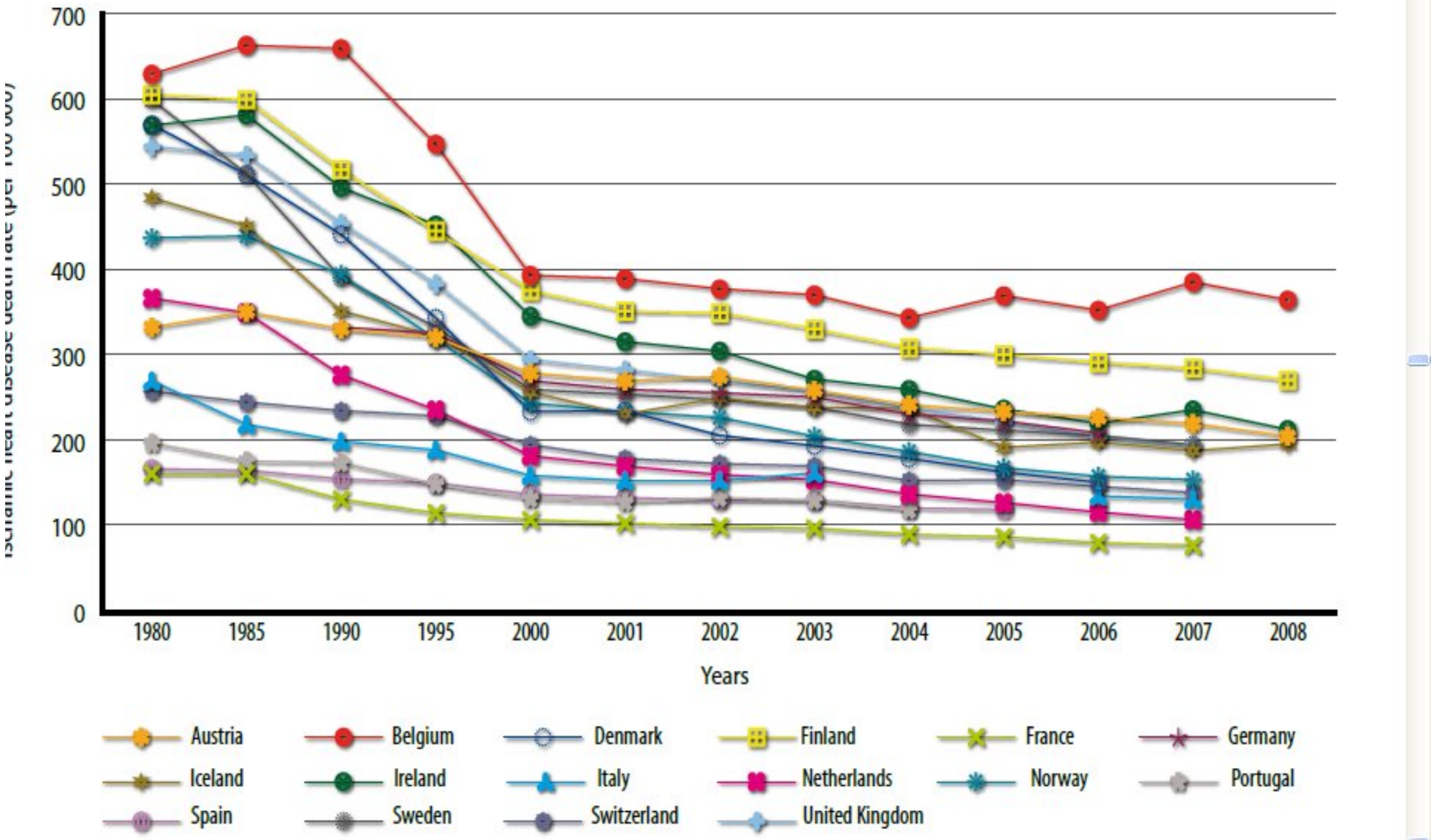
37 (43 of 164) 125% Find

gure 40 World map showing fruits and vegetable intake (grams per person per day) (*ii*).



gure 69 Trends in CVD mortality rates (age standardized) in developed countries (*xi*).



gure 701 Trends in CVD mortality rates in the United ingdom (*15, xi*).

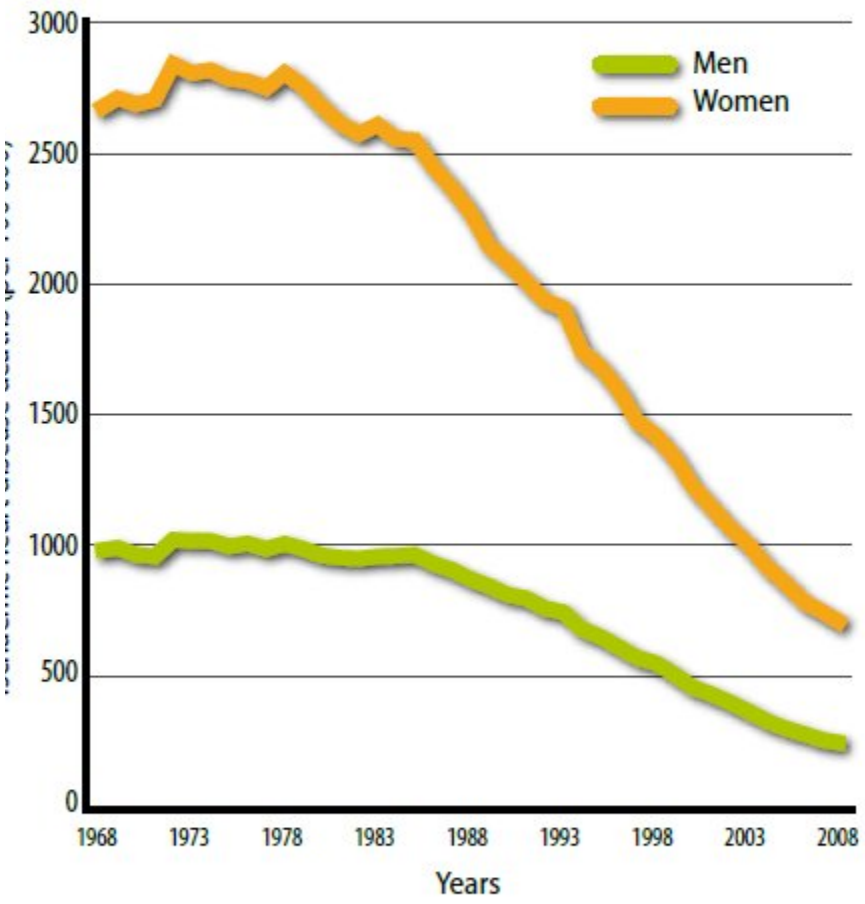
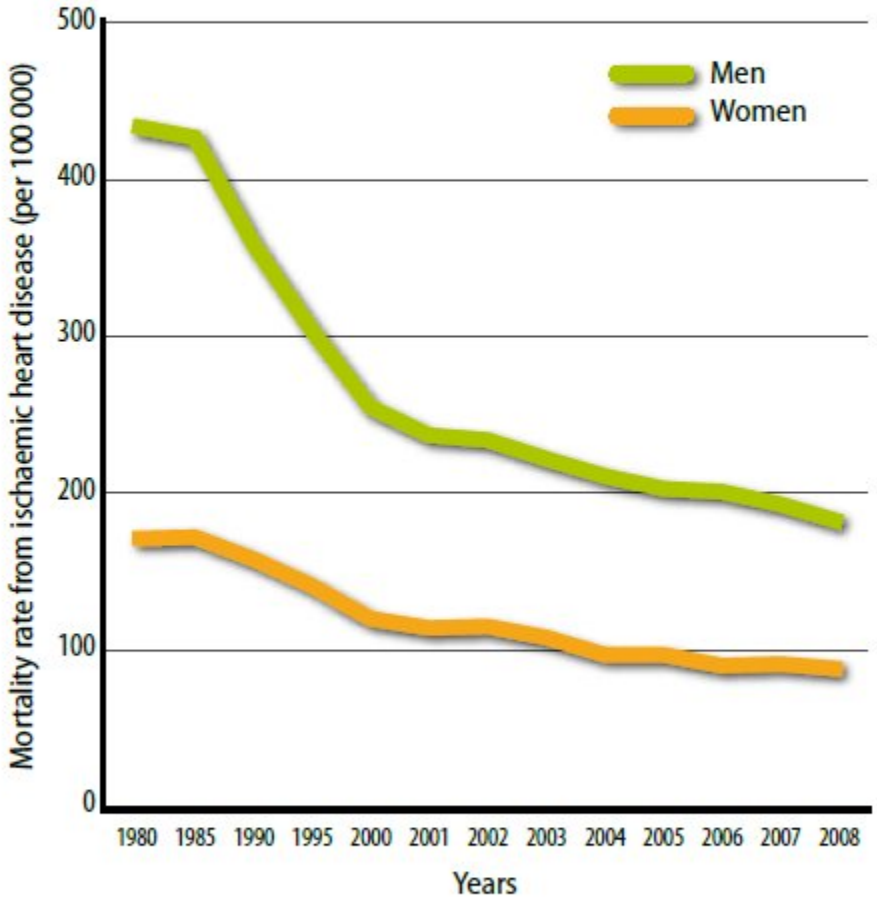
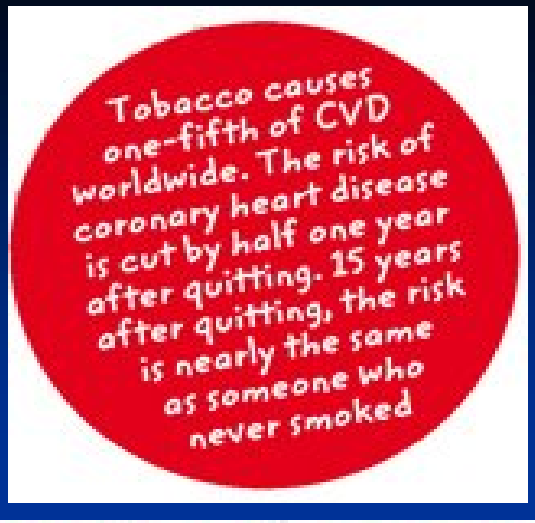


Figure 702 Trends in CVD mortality rates in Finland (*14, xi*).





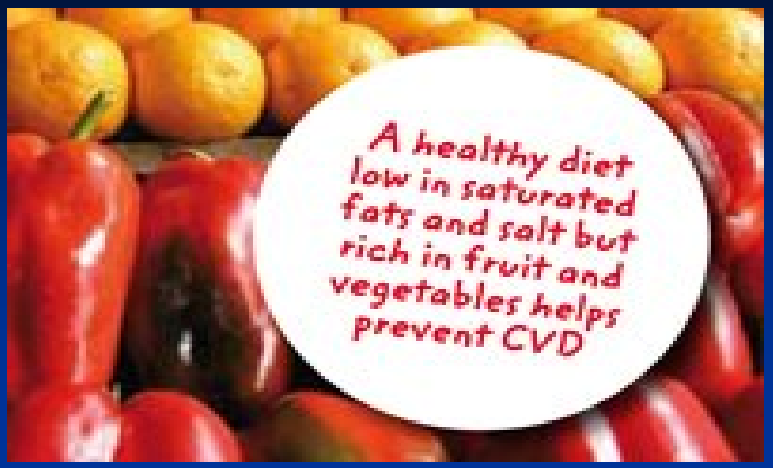
1. Ban smoking from your home

- Stop smoking tobacco in the home to improve your own and your children's heart health.
- Implement a new rule in your home: for every cigarette someone smokes, an extra household chore is waiting.

Smoking

- In 2001, 27% of adults aged 16 years and over smoked cigarettes in England; 28% of men and 25% of women.
- Mortality from CHD is 60% higher in smokers.
- Regular exposure to passive smoking increases CHD risk by 25%.
- In 2000, about 1 in 8 deaths from cardiovascular disease (CVD) were attributable to smoking in the UK.
- World Health Organization (WHO) research estimates that over 20% of CVD is due to smoking.

2. Stock your home with healthy food options



- Start the day with a piece of fruit or prepare your own lunch at home to ensure healthy options are taken to work or school

غذای سالم بخورید : روز خود را با خوردن یک میوه شروع کنید، ناهارتان را در خانه آماده کنید، عصرانه شما شامل حداقل ۲ یا ۳ واحد سبزیجات برای هر فرد باشد (رژیم غذائی شما غنی از میوه و سبزیجات باشد.

- Make sure every evening meal contains at least two to three servings of vegetables per person

- فعال باشید: مدت زمان **تماشا کردن تلویزیون** را به کمتر از ۲ ساعت در روز محدود کنید. فعالیتهای بیرون از خانه برای خانواده تان تدارک ببینید مثل دو چرخه سواری، کوهنوردی یا بازی های ساده در پارک و باغ اگر ممکن بود به جای ماشین از دوچرخه استفاده کنید یا پیاده روی کنید.

4. Know your numbers

- Visit a healthcare professional who can measure your blood pressure, cholesterol and glucose levels, together with waist-to-hip ratio and body mass index (BMI)

اعداد خود را بدانید: یک کارشناس سلامت را که می تواند وزن، دور کمر، دورباسن و فشارخون شمارا اندازه گیری کند ملاقات کنید. قند خون و چربی خون خود را اندازه گیری کنید

- Once you know your overall CVD risk, you can develop a specific plan of action to improve your heart health. Make this action plan clearly visible in your home as a reminder !

- By actioning the house-hold steps above, you and your family can reduce the burden of CVD wherever you are in the world. However, not all heart events are preventable. It is therefore important to know what action to take should a heart attack or ischaemic stroke, occur in the home.

Fat and oil

1 g. = 9 Kcal

1- Saturated fatty acids (SFA)

Short chain fatty acid (4 - 6 C.)

Medium chain fatty acid (8 – 11 C.)

Long chain fatty acid (≥ 12 C.)

2- Mono - unsaturated fatty acids (MUFA)

3- Poly - unsaturated fatty acids (PUFA)

By 2006 all packaged food products sold in the United States must have nutrition labels that include information about the trans fat content .

Nutrition Facts

Serving Size 1 cup (200g)
Servings per container 2

Amount per serving	
Calories 220	Calories from Fat 100
	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 2g	
Cholesterol 30 mg	10%
Sodium 235 mg	10%
Total Carbohydrate 16g	5%
Dietary Fiber 5g	20%
Sugars 4g	
Protein 6 g	

Vitamin A
Citamin C
Calcium

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

Epidemiology of Coronary Heart Disease Incidence and prevalence

Mortality rates

- Coronary heart disease (CHD) is the most common cause of death (and premature death).
- 1 in 5 men and 1 in 7 women die from CHD.
- Death rates from CHD have fallen by 45% for people aged under 65 years in the last 10 years. This fall is fastest in those aged 55 years and over. It is largely due to a reduction in major risk factors (mostly smoking) and improvement in treatment and secondary prevention.
- Death rates from CHD are highest in Scotland, and the North of England, and lowest in the South of England.
- For more than 25 years these rates have been consistently highest in Scotland.

Morbidity rates

- The average incidence of myocardial infarction is 600 per 100,000 in men aged 30-69 and 200 per 100,000 in women. The incidence increases with age.
- The prevalence of CHD was higher in Scotland (4.6%) than in Wales (4.3%) or England (3.5%).
- The prevalence is higher in lower socioeconomic groups.
- Of note, mortality from CHD is falling but morbidity appears to be rising.

Risk factors

- The aetiology of CHD is multifactorial. It is the result of interaction between genetic, lifestyle and environmental factors.

Age

- CHD increases with age.

Gender

- Traditionally, CHD has been considered a disease of men. However, CHD is the leading cause of death in both men and women.
- It is responsible for a third of all deaths in women worldwide and half of all deaths in women over the age of 50 years in developing countries.

Social deprivation

- In England and Wales there is a positive correlation between deaths from circulatory diseases and levels of deprivation.
- There is a marked difference in prevalence of coronary heart disease between and within communities.
- Men and women living in the West of Scotland are nearly six times more likely to die prematurely from CHD than men and women living in the South West of England.
- The difference in CHD rates in different socioeconomic groups is related to many factors, including diet, smoking, exercise, and alcohol.

Infrequent exercise

- Physical activity reduces the risk of CHD.
- The 2002 World Health Report estimated that over 20% of CHD in developed countries was due to physical inactivity.
- Recommended physical activity levels are 30 minutes of moderate physical activity on 5 or more days per week.
- Over one third of UK adults are estimated to be inactive (exercised for less than one occasion of 30 minutes per week).

Alcohol

- Higher levels of consumption increase risks from other causes.
- The World Health Report in 2002 estimated that 2% of CHD in men in developed countries is due to excessive alcohol consumption.

Psychosocial wellbeing

- Work stress, sunshine or cloudy wethear.
- lack of social support,
- depression, Anxiety
- personality (particularly hostility) can all increase CHD risk.

Blood pressure

- For adults aged 40 to 69 years, each 20 mm Hg rise in usual systolic blood pressure or 10 mm Hg rise in diastolic blood pressure doubles the risk of death from CHD.

- The INTERHEART study showed that 22% of heart attacks in Western Europe were due to a history of high blood pressure and those with hypertension had almost twice the risk of a heart attack.

Overweight and obesity

- Obesity is an independent risk factor for CHD.
- It is also a risk factor for hypertension, hyperlipidaemia, diabetes and impaired glucose tolerance.
- Central or abdominal obesity is most significant.
- Those with central obesity have over twice the risk of heart attack.

Diabetes

- Men with type 2 diabetes have a 2 to 4 times greater annual risk of CHD;
- women have a 3 to 5 times greater risk.
- Over 4% of men and 3% of women in England have diagnosed diabetes. The prevalence is increasing.

Ethnicity

- South Asians living in the UK (people from India, Pakistan, Bangladesh and Sri Lanka) have a higher premature death rate from CHD (46% higher for men; 51% higher for women).
- Hypotheses for this include migration, disadvantaged socioeconomic status, 'proatherogenic diet', lack of exercise, high levels of homocysteine and lipoprotein(a) (Lp(a)), endothelial dysfunction and enhanced plaque and systemic inflammation.
- The premature death rate from CHD in West Africans and people from the Caribbean is much lower (half the rate compared with the general population for men and two-thirds of the rate for women).

Family history

- First-degree relatives of patients with premature myocardial infarction have double the risk themselves.
- Premature CHD is that before age 55 years in men and 60 years in women.
- More than one third of admissions for premature myocardial infarction could be prevented by screening and treating first-degree relatives.

Essential fatty Acid Deficiency

- The human brain, central nervous system, and membranes throughout the body require omega-3 faty acids, especially eicosapentaenoic acid EPA) and docosahexaenoica cid (DHA), for optimum function.

- Connor et al. (1992) proposed that greater availability of long-chain omega-3 fatty acids allowed humans to develop their complex brain and neural system.

Poor nutrition

- There are national, regional, socioeconomic and ethnic differences in nutrition.
- A WHO report in 2003 stated that a diet high in fat (particularly saturated fat), sodium and sugar and low in complex carbohydrates, fruit and vegetables increases the risk of CVD.
- It has been recommended that the percentage food energy derived from fat should be 35%, with 11% from saturated fat. The National Diet and Nutrition Survey in 2000/2001 found that the total energy intake from fat was 36% in men and 35% in women with 13% from saturated fat.
- It also found that the average intake of fruit and vegetables was fewer than 3 portions per day compared with the recommended 5 portions.
- In the same survey salt intake was 11 g per day for men and 8.1 g for women. However, the Scientific Advisory Committee on Nutrition suggests that salt intake should be no more than 6 g per day.

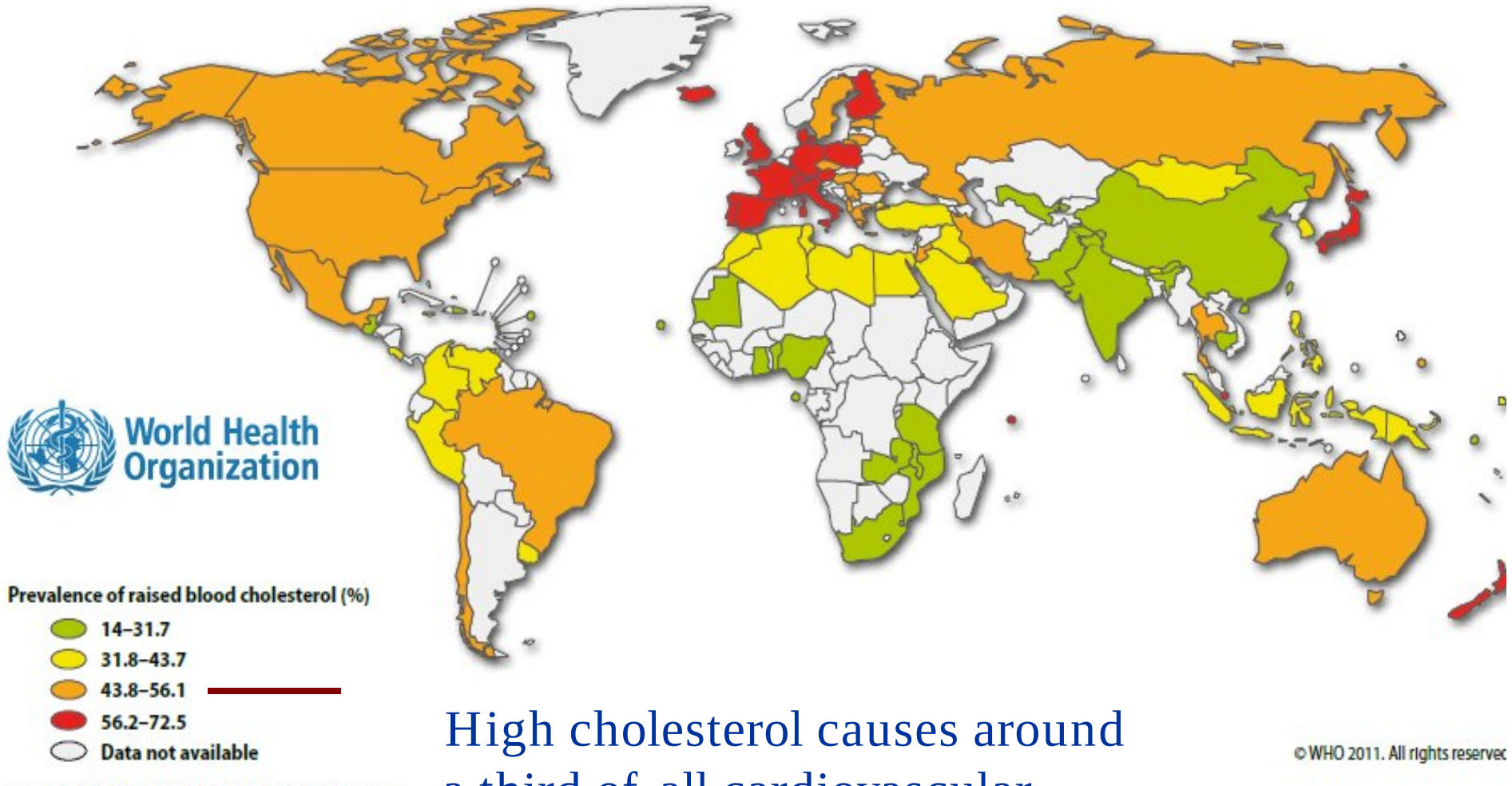
Poor nutrition

- Trans fatty acids reduce high-density lipoprotein (HDL) and increase low-density lipoprotein (LDL) cholesterol and can increase CHD risk. A meta-analysis showed that a 2% increase in the energy intake from trans fatty acids increased CHD incidence by 23%.11
- Eating oily fish rich in omega-3 fatty acids has been shown to reduce CHD mortality.12
- Increased intake in dietary fibre also appears to reduce risk.

Cholesterol

- CHD risk is related to cholesterol levels.
- The INTERHEART study suggested that 45% of heart attacks in Western Europe are due to abnormal blood lipids.
- People with low levels of HDL cholesterol have an increased risk of CHD and a worse prognosis after a myocardial infarction.
- In the UK, it is suggested that the target cholesterol is < 4 mmol/L for people with diabetes or established CVD or for people at high risk of developing CVD.
- People with HDL cholesterol <1 mmol/L should also be considered for treatment.

Figure 47 World map showing the prevalence of raised blood cholesterol * in males (ages 25+, age standardized) (6), (* ≥ 5 mmol/l or on medication for raised blood cholesterol).



High cholesterol causes around a third of all cardiovascular disease worldwide.

5 mmol/l : 0.0259 = 193 mg/dl

To convert to SI units:

multiply total cholesterol, LDL-cholesterol, HDL-cholesterol (mg/dl) × 0.0259=mmol/l;

multiply Triacylglycerol (mg/dl) × 0.0113=mmol/l.

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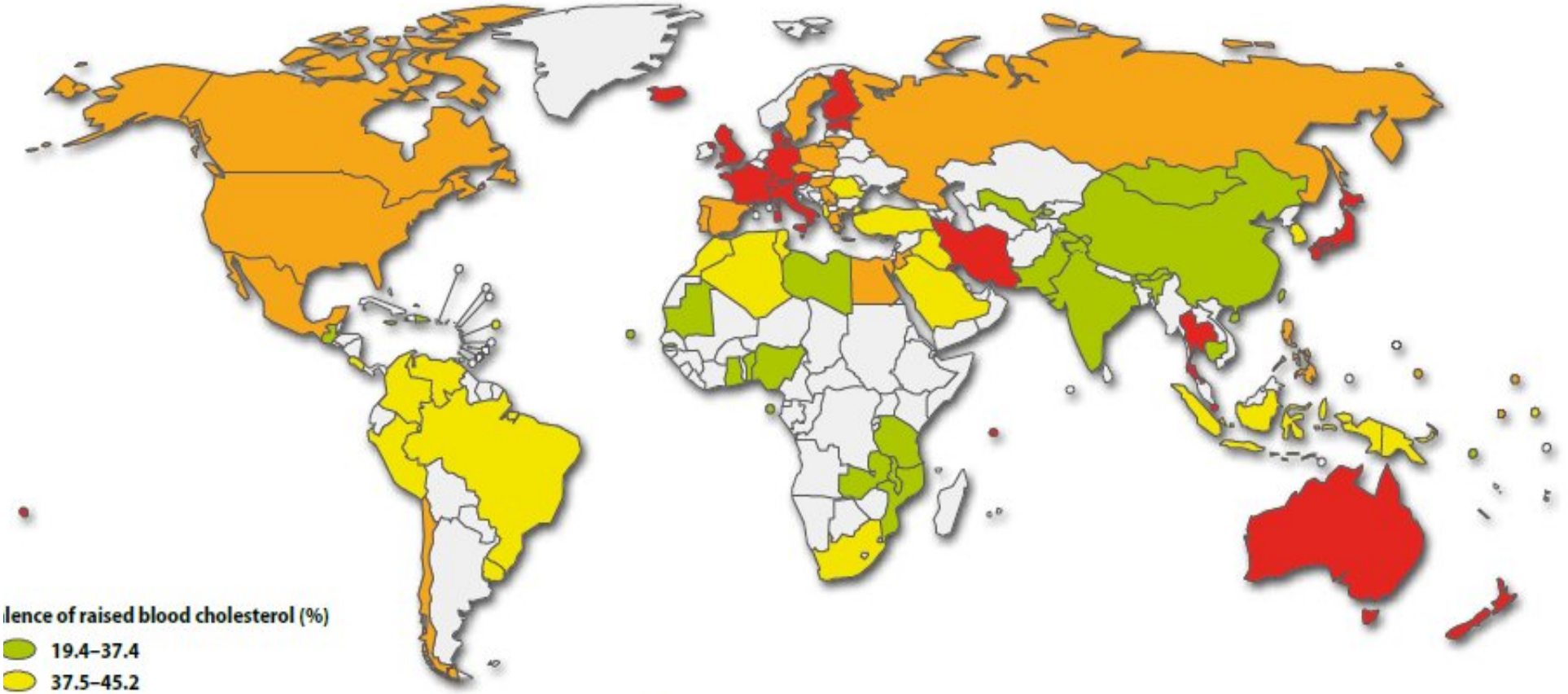
World Health Organization

valence of raised blood cholesterol * in females (ages 25+, age standardized) (*6*),

d blood cholesterol).



lence of raised blood cholesterol (%)

- 19.4–37.4
- 37.5–45.2
- 45.3–54.3
- 54.4–67
- Data not available

mol/l or on medication for raised blood cholesterol.

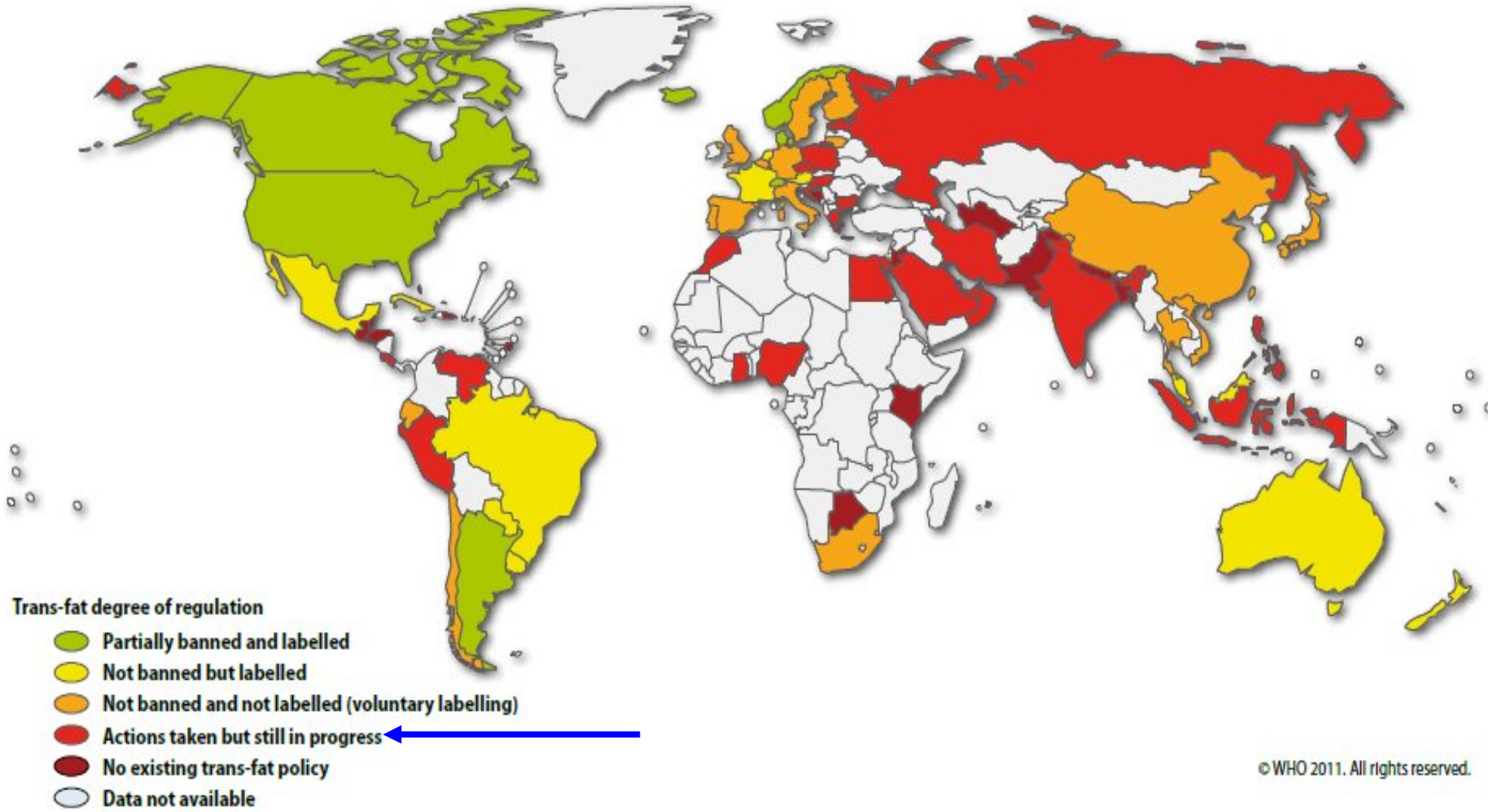
World Health Organization

0.24 in

Where Do They Come From

- They are the result of anaerobic bacterial fermentation in ruminant animals and are thereby introduced into the food chain.
- Humans consume them in the form of meat and dairy products.
- Oils are hydrogenated to increase their plasticity and chemical stability, hence their potential use in food products.

Figure 78 World map showing countries that have taken regulatory action against transfat (*xiii-xxvii*).



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Serum homocysteine

- It was previously thought that elevated levels of homocysteine is an independent risk factor for IHD,
- likely due to oxidative damage to the endothelium, platelet activation and thrombus formation.
- The theory was that dietary supplementation with folic acid could reduce homocysteine levels and therefore CHD incidence.
- A meta-analysis in 2005 disputed this.

- Public health targets

Comparison of Consumption to Recommendations

FIGURE 5-1. How Do Typical American Diets Compare to Recommended Intake Levels or Limits?

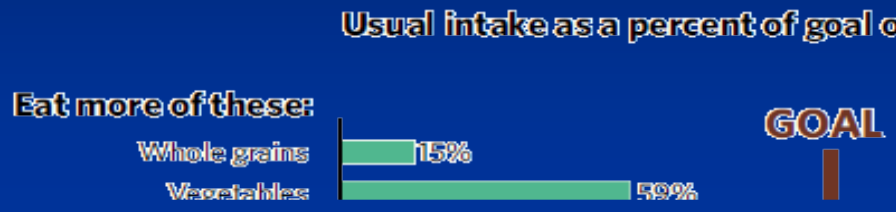

Figure 79 **Salt consumption per capita and salt consumption surplus in selected countries (*xxvii-xxx*).**

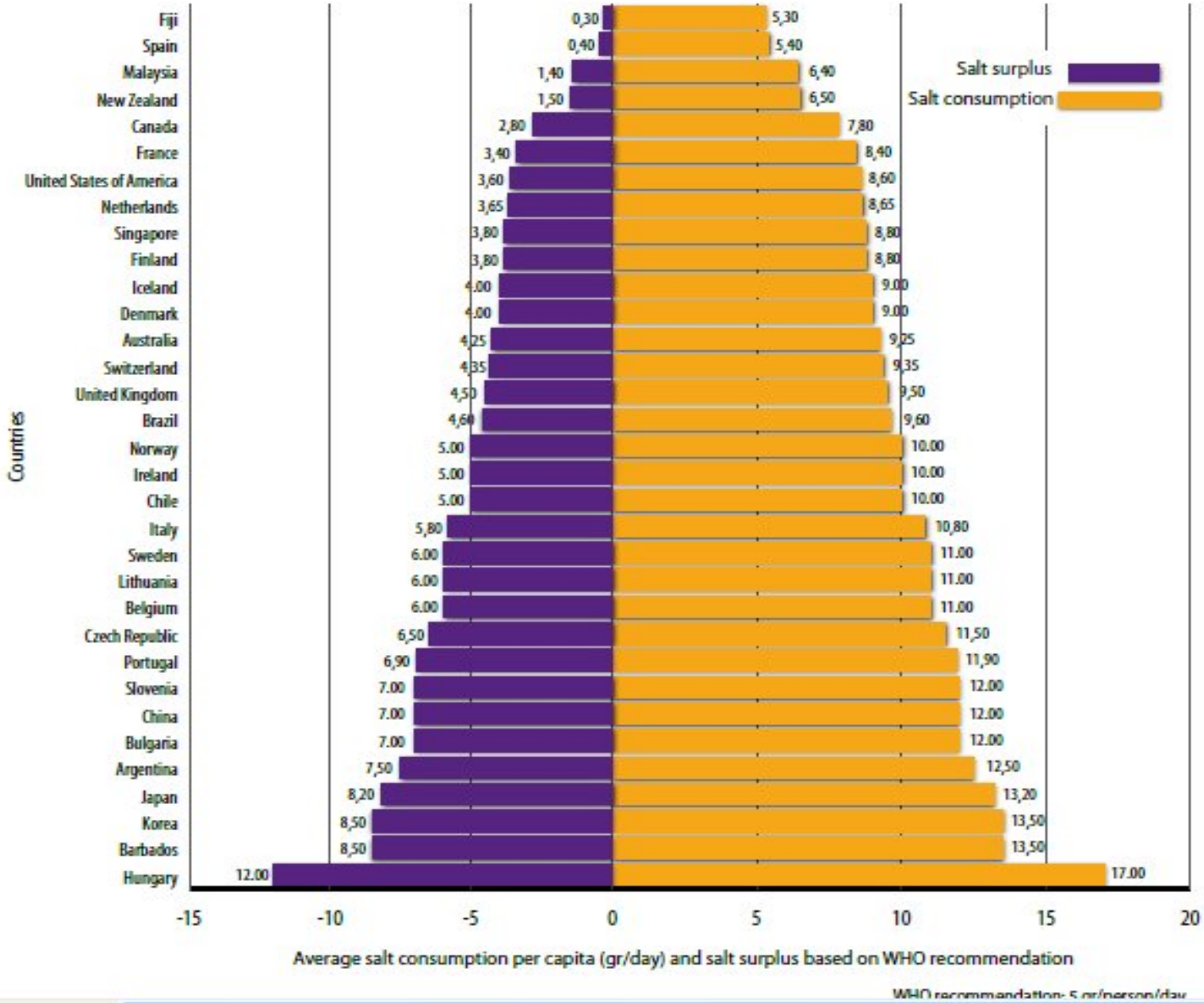

FIGURE 3-3. Fatty Acid Profiles of Common Fats and Oils

www.DietaryGuidelines.gov

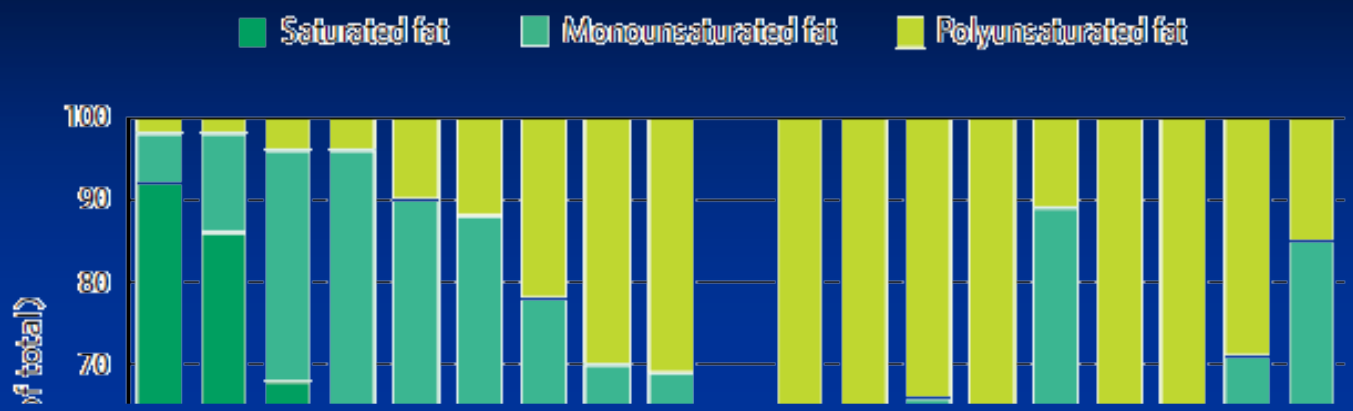

TABLE 8-12

Dietary Recommendations for Hyperlipidemia

	Total Fat (% kcal)	Sat Fat (% kcal)	Poly Fat (% kcal)	Cholesterol (mg/day)	Mono Fat (% kcal)	Other
NCEP 1991 Children and adolescents						CHO 55% PROT 15%-20% Appropriate calories for growth and maintain desirable BW
Step-One	<30%	<10%	≤10%	<300	~10-13%	
Step-Two	<30%	<7%	≤10%	<200		
AAP 1998 Children >2 y	No more than 30%, no less than 20%	<10%		<300		If LDL still high→ <7% saturated fat <200 mg cholesterol

Adapted with permission from Stang J, Story M, editors: *Guidelines for adolescent nutrition services*, Minneapolis, 2005, Center for Leadership Education and Training in Maternal and Child Nutrition, Division of Epidemiology and Community Health, School of Public Health, University of Minnesota.

NCEP, National Cholesterol Education Program of the National Heart, Lung Blood and Lung Institute, NIH; *AAP*, American Academy of Pediatrics; *CHO*, carbohydrate; *PROT*; protein.